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Promoting Competition or Helping the Less Endowed? Distributional Preferences and Collective Institutional Choices under Intragroup Inequality

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Abstract

Unequally distributed resources are ubiquitous. The decision of whether to promote competition or equality is often debated in societies and organizations. With heterogeneous endowments, we let subjects collectively choose between a public good that most benefits the less endowed and a lottery contest in which only one individual in a group receives a prize. Unlike standard theoretical predictions, the majority of subjects, including a substantial number of subjects who believe that their expected payoffs are better in the contest, vote for the public good. Our data suggest that people's collective institutional choices may be driven by inequality-averse concerns. It also suggests that the collective decision to select the option for the public good depends on voting rules.

Keywords

heterogeneity, experiment, cooperation, competition, public goods, inequality

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The prevalence of heterogeneous resources is one of the most fundamental features of our organizations and societies today (e.g., Stiglitz 2012; Piketty 2014). For example, there are wide income gaps within societies. The Gini coefficient of household disposable incomes is on average 0.31 even in Organization for Economic Cooperation and Development countries (Organization for Economic Cooperation and Development 2013). Moreover, inequality across regions in many countries is increasing over time (see, e.g., Baldwin and Wyplosz 2015 for regional disparity in the United Kingdom). It is also often the case that the distribution of resources is skewed to the right. While the heterogeneity of resources has some positive aspects such as the potential to increase material gains for some people, it nonetheless has negative aspects. For instance, inequality in society or regions often leads to serious intragroup conflicts. We therefore face a difficult collective decision: as a society or a country, should we promote competition by which ex post inequality may be enhanced? Or should we enhance equality by offering some mechanism that assists the less endowed?

People's collective choices on policies have important consequences for resulting norms, people's behaviors, and the degree of intragroup conflicts in a society. For example, inequality can be enhanced by policies and as a result may increase antisocial behavior, such as violent crime in metropolitan counties in the United States (e.g., Kelly 2000). The government could enrich education programs for the poor or introduce social welfare programs, such as unemployment benefits, in order to alleviate poverty, while reducing programs that promote competition, such as subsidies to firms. This kind of policy change could help reduce the income gap and may create a fairer society. However, it may displease more well-off individuals who would not benefit from such a scheme. The negative consequences of inequality are also serious in less developed countries. For instance, if existing regional inequalities were magnified by official policies, it may result in political conflicts in sub-Saharan Africa (e.g., Østby, Nordås, and Rød 2009). Also, some firms offer incentive schemes such as tournaments, which may contribute to increasing the productivity of workers. Such competition-oriented policies may, however, lead to more uncooperative behaviors among workers (e.g., Akerlof and Yellen 1988; Trevor, Reilly, and Gerhart 2012).

In modern democratic societies, people have the right to choose their preferred policies either directly or indirectly through votes. Given the fact that very wealthy people account for a small percentage of the population, one might expect that most countries or organizations would employ strong redistributive or cooperative policies. In reality, however, a large degree of redistribution is rarely observed. For instance, there has been an overall trend to reduce tax rates for high-income groups over the last several decades in countries such as the United States and the United Kingdom (e.g., Piketty and Saez 2007; Atkinson, Piketty, and Saez 2012; Alvaredo et al. 2013).[1] Field observations such as this may not reflect the population's collective distributional preferences. For example, the literature on political economy explains that moderate redistributive policies could result from political processes such as low voter turnout rates among low-income people, party loyalty, and

electoral competition in representative democracy (Harms and Zink 2003 for a survey). It is also possible that the less endowed may in fact prefer light redistributive policies for various reasons. For instance, they may tolerate inequality if they have a prospect of upward mobility (Harms and Zink 2003, 657-65). In recent decades, scholars have actively studied people's collective institutional choices using laboratory experiments. However, little attention has yet been paid to people's collective preferences for implementing either competitive or cooperative institutions within a heterogeneously endowed group, and this question remains to be empirically answered.

Exploring the behavioral principles behind people's collective choices on this topic is not straightforward, however. First, previous extensive experiments have found that some individuals have other regarding preferences such as inequality aversion (see Fehr and Schmidt 2006 for a survey). For example, some people may enjoy higher non-material gains if the payoffs are similar to each other. Therefore, we cannot infer people's institutional choices only from material incentives. Second, recent experiments have shown that egalitarian subjects—those who prefer fair distribution of payoffs—are more likely to avoid competitive environments when self-selecting environments in real-effort experiments (e.g., Bartling et al. 2009; Balafoutas, Kerschbamer, and Sutter 2012).[2] The more egalitarian preferences they have, the less likely they may be to support competitive institutions in the context of this study. The voting decisions of egalitarian individuals may nonetheless depend on the degree of material incentives offered under a competitive regime. Even a person strongly averse to inequality might support a competitive institution if the potential benefits from competition were sufficiently high. In addition, people's voting decisions may depend on the size of their endowments because material and non-material incentives differ according to endowment size. Third, other regarding preferences in risky situations constitute a new research area that remains to be explored. The selection of a competitive institution involves a risk whereby people receive lower returns if they lose the competition. People's decisions might be based on ex ante payoffs (i.e., opportunities), ex post payoffs, or a mix of the two (e.g., Brock, Lange, and Ozbay 2013). Fourth, a wealth of literature shows that in situations where subjects' resources are unbalanced, the amounts of resources and subjects' levels of cooperativeness are negatively correlated (e.g., Chan et al. 1996; Maurice, Rouaix, and Willinger 2013). This tension between highly endowed and less endowed members may be sufficiently severe to inspire the collective preference for a more competitive environment.

We conducted an experiment in order to study people's collective institutional choices between a competitive scheme versus a public good scheme that helps the less endowed more when endowments are unequally distributed. A novel feature of our design is to let subjects collectively select one of two fundamentally different institutions within each of which the same endowments are used. Subjects are randomly assigned endowments, with the distribution being unbalanced within their groups. Each group then has to collectively choose a regime designed to serve the

public good or a lottery contest regime by voting. If a group implements the public good, each member decides how much to contribute for their group. The total contributions are doubled and are then redistributed, so that subjects with smaller endowments receive more from the public account. By contrast, if a group selects the contest option, then the members compete for a prize. Under this regime, each member decides how many points they want to allocate to their lottery account. The more points a subject assigns to the account, the more likely he or she is to win the competition and receive the prize. Only one member wins the competition. Thus, subjects would experience greater ex post inequality if this regime is selected. The policy implementation and subjects' interaction under collectively selected regimes are one-shot.[3]

Our data show that the majority of subjects prefer to serve the public good, contrary to the standard theoretical prediction. This study also reveals that a substantial number of subjects who believe that the material incentives under the contest are higher actually vote for the public good. A comparison of the distributions of payoffs suggests that subjects' votes may be driven by inequality-averse motives. The average Gini coefficients of realized payoffs within groups are significantly smaller with the public good than with the contest scenario. Moreover, subjects on average believe that payoffs are more equally distributed among members if a public good is created. Two clear results were found regarding groups' collective vote outcomes. First, the majority of groups selected the public good even when there was a higher level of efficiency under the contest regime than under the public good regime. Second, however, the likelihood of the public good being adopted largely depends on which voting rule is used. This study found that the public good is less likely to be selected if highly endowed subjects have higher voting power.

Experimental Design

The experiment consisted of two phases. In the first phase, endowments were randomly given to subjects. The second phase is a voting stage, followed by an allocation stage. Subjects made onetime policy implementation decisions and allocation decisions. Our study consists of three main treatments, which will be referred to as ''choice treatments'' in the article. We also conducted one control treatment, whereby a public good was exogenously imposed in phase 2 in order to check whether the democratic decision-making process influences subjects' behaviors in the allocation stage (Table 1).

At the onset of phase 1, subjects in all treatments were randomly assigned to a group of five individuals. In each group, one subject received fifty points, two subjects each received twenty points, and the remaining two were given ten points each. The assignment of endowments was random: the probabilities with which they received fifty, twenty, and ten points were 1/5, 2/5, and 2/5, respectively. We refer to the set of subjects who were given fifty, twenty, and ten points as sets H, M, and L,

Table 1. Summary of Treatments.

Treatment	Prize size in a lottery contest	Number of sessions	Number of groups (subjects)	Standard theoretical predictions under the risk-neutral preference: Allocation amounts: Public good	Allocation amounts: Lottery contest	Payoff: Public good	Payoff: Lottery contest	Voting
Choice treatments								
L	50 Points	4	15 (75)	$c_i = 0$ for all i	$x_i = 8$ for all i	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	$\pi_H = 52$ $\pi_M = 22$ $\pi_L = 12$	All members vote for contest
H	110 Points	4	13 (65)	$c_i = 0$ for all i	$x_H \approx 21$ $x_M = 20$ $x_L = 10$	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	$\pi_H = 57.5$ $\pi_M = 27.2$ $\pi_L = 13.6$	All members vote for contest
VH	220 Points	4	15 (75)	$c_i = 0$ for all i	$x_H = 50$ $x_M = 20$ $x_L = 10$	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	$\pi_H = 110.0$ $\pi_M = 40.0$ $\pi_L = 20.0$	All members vote for contest
Control treatment								
Exogenous public good	—	2	6 (30)	$c_i = 0$ for all i	—	$\pi_H = 50$ $\pi_M = 20$ $\pi_L = 10$	—	—

Note: c_i (x_i) is the allocation of subject i to his or her public (lottery) account. π_H, π_M, and π_L are (expected) payoffs of sets H, M, and L subjects, respectively. L = low; H = high; VH = very high.

respectively. Note that the endowments of set M and set L subjects were less than the average in their groups, which was 22 ([= 50 + 20 × 2 + 10 × 2]/5).

In the three choice treatments, the Low, High, and Very High treatments—dubbed L, H, and VH—phase 2 began with subjects deciding whether to create a public good or to implement a lottery contest. Subjects subsequently stated their beliefs regarding the other four members' votes. In order to avoid a hedging problem, the belief elicitation task was not incentivized. Either the public good or the contest was then collectively implemented in accordance with the result of the voting, and each subject also made an allocation decision under the selected regime. (In the control treatment, which is called the "Exogenous public good treatment," subjects did not vote on the two regimes; they only decided how much to contribute to their group's public goods.) Once all of the subjects had decided on the allocation amounts, they submitted beliefs regarding the other four members' allocation amounts before being informed of the outcomes of the allocation stage. As in the first belief elicitation task, this elicitation task was not incentivized. However, at the end of the experiment, just before they were informed of the outcome of the allocation stage, subjects were asked to answer incentivized questions concerning risk attitudes.[4] Figure 1 provides a schematic diagram of the experiment.

Two Possible Regimes

The public good corresponds to goods and services that redistribute people's wealth and also increase efficiency (total gains). Examples include government support for education for the poor and voluntary mentoring programs for employees in corporations. Redistributive programs, such as social welfare provisions in countries and poverty alleviation programs in international organizations, may also have this property if the poor utilize received sources to improve their education and/or health and accordingly productivity among the poor rises. If a public good is created, each group member simultaneously decides how much to allocate to their private account and to the public account. The contribution amounts must be integers between 0 and their assigned endowments (50, 20, or 10). A subject receives one point for each point that she allocates to her private account. The allocation to the public account, by contrast, is doubled and redistributed among group members: 25 percent of the amounts are given to each of the two set L subjects, 20 percent of them are given to each of the two set M subjects, and 10 percent of them are given to the set H subject (note that 25 percent × 2 + 20 percent × 2 + 10 percent = 100 percent). In other words, the less endowment a member has, the more the member receives from the public account. This kind of redistribution rule is found, for example, in education programs and public welfare assistance to help the poor. In firms, voluntary "buddies" programs tend to help less-skilled workers more than highly skilled workers.[5]

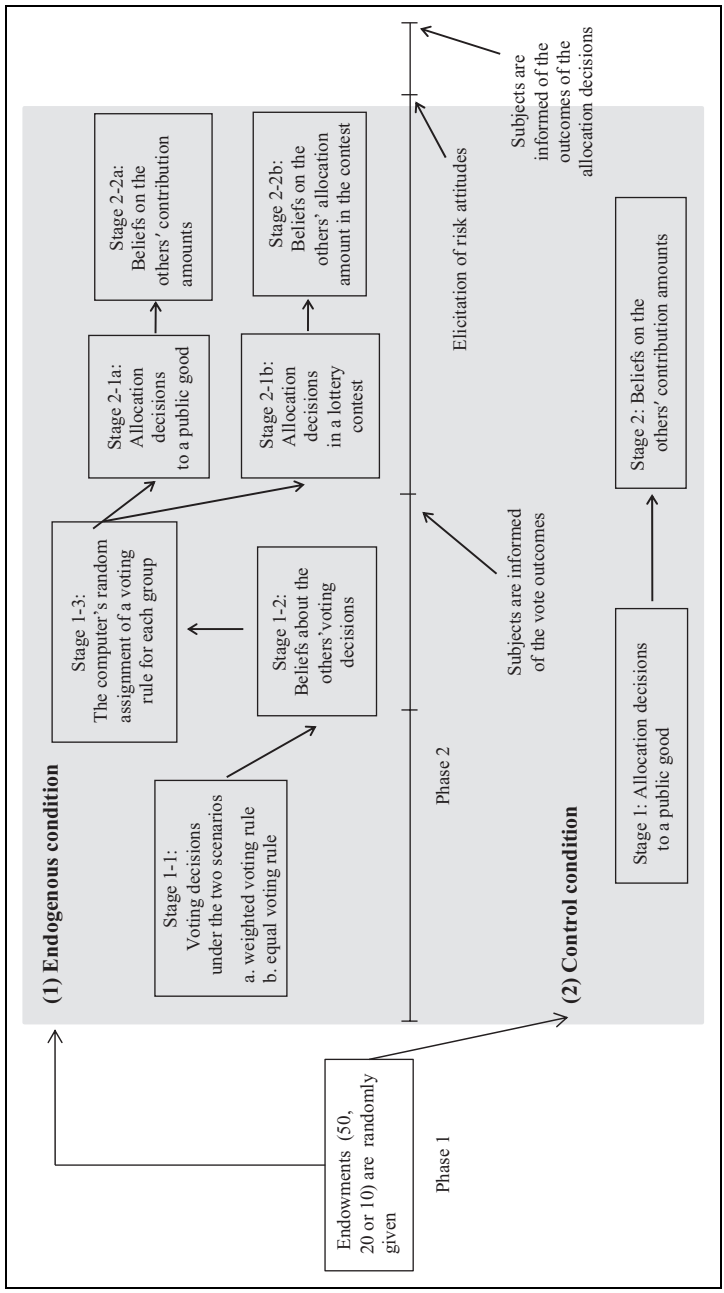

Figure 1. Experimental design.

Suppose that the public good is created and a member having an endowment E_i contributes c_i to the public good. Then, that member's payoff, π_i, is expressed as follows:

$$\pi_i = (E_i - c_i) + \alpha_i \cdot 2\sum_{j=1}^{5} c_j, \quad (1)$$

where $\alpha_i = .1$ if subject i is a set H subject; $\alpha_i = .2$ if i is a set M subject; and $\alpha_i = .25$ if i is a set L subject.

By contrast, when the lottery contest is implemented in a group, subjects compete with the other four members for a prize. Each group member simultaneously decides on an allocation amount to the lottery account. The prizes are 50, 110, and 220 points, and the competition is low, high, and very high in the L, H, and VH treatments, respectively. Only one member in the group receives the prize. Each subject can increase their winning probability by raising the allocation amounts to the lottery account. Suppose that subject i makes an investment of x_i and that the other four members allocate X_{-i} in total to their lottery accounts. Then, subject i's winning probability is $\frac{x_i}{x_i + X_{-i}} \cdot x_i$ must be an integer ($x_i \in \{0, 1, 2, \ldots, E_i\}$). When all five members allocate nothing (i.e., $x_i = 0$ for all i), the prize is given to one member randomly (i.e., with a probability of 20 percent). Subject i receives the remaining points, $E_i - x_i$, as a part of his or her payoff. The competition in this kind of contest is also prevalent in some real-world situations. For example, there are often winners who gain a large surplus and losers who gain less in a market economy.[6] A further example is the case where workers exerting more efforts are more likely to get promoted to higher positions in their organization. Their chances of promotion, however, negatively depend on the contributions of other workers as higher-ranked positions are limited. A person may be promoted even with zero or small efforts if other employees do not strive for promotion.

Once all subjects had made allocation decisions under their collectively selected regimes, they were asked to submit beliefs on how much other group members had allocated.[7] These elicited beliefs were used in analysis to calculate the (expected) payoff that each subject believed they would obtain under the selected regime.

Voting Rules

This study let subjects vote under two voting rules and assessed the effects of voting power on subjects' collective institutional choices. This analysis was conducted, as collective institutional choices may depend on voting rules. For instance, Markussen, Reuben, and Tyran (2014) found that an intergroup competition scheme is more likely to be selected in a set of three groups when a majority rule based on votes of all subjects in the three groups is used, relative to when a group veto rule (a rule that imposes a policy if the majority in each group supports it) is used. Vote outcomes

may differ by voting rule in our study as well because subjects' voting decisions may be affected by the heterogeneous endowments, considering that incentives under each regime may depend on endowment size.

Specifically, in the choice treatments, at the onset of phase 2, subjects voted on whether to have the public good or the lottery contest for each of the two scenarios: (1) the equal voting (EV) rule is used and (2) the weighted voting (WV) rule is used.[8] After all of the subjects had voted, they were asked about their beliefs concerning how others had voted before being informed of the collective outcomes.[9] The two voting decisions were incentive compatible. Once all of the subjects had submitted their votes and answered the questions on beliefs, the computer assigned either of the two rules to each group with a probability of 50 percent each. Subjects' votes under the selected voting rule were used to calculate the collective vote outcome of their groups.[10] When the weighted voting rule was assigned, the voting power of subject i was $E_i/110$, where $110 = 50 + 20 + 20 + 10 + 10$ (the sum of endowments in his group). Consequently, the distribution of voting power among his group members was unequal. The voting power of set H subjects was the largest. However, it was not possible for them to decide the policy selection independently, as their voting power equaled $50/110$ ($= .45 < .5$). Therefore, the votes cast by subjects belonging to set M and set L also influenced each group's collective decision. When the equal voting rule was assigned to a group, the voting power was one-fifth for each subject. In other words, the standard majority rule determined the group's regime.

Elicitation of Risk Preferences

Once subjects had submitted beliefs on others' allocation amounts, they were asked questions concerning risk attitudes. The questionnaire on risk attitudes consists of the ten questions used by Holt and Laury (2002). We included this task in order to assess whether subjects' institutional choices were affected by risk attitudes.

Theoretical Predictions

A group has a collective action dilemma if the public good is selected in that group because the marginal per capita return (MPCR) is $2{\cdot}\alpha_i$, which is less than 1 for each subject, as shown in equation (1). Therefore, according to the standard theory, contributing nothing to the public account is a strictly dominant strategy for each group member. Subjects in sets H, M, and L obtain 50, 20, and 10 points, respectively, as payoffs under Nash equilibrium.

By contrast, if the lottery contest is implemented in a group, the members can have some expected gains, regardless of their risk preferences. Suppose that each member in a group is risk neutral. Then, the utility function of a subject is

proportional to his or her expected payoff. The expected payoff of subject i, $E[\pi_i]$, is calculated by:

$$E[\pi_i] = (E_i - x_i) + \frac{x_i}{x_i + X_{-i}} z. \quad (2)$$

Here, $z = 50$, 110, and 220 in the L, H, and VH treatments, respectively. x_i is subject i's investment amount. For simplicity, let us also assume that two set M subjects in a group allocate the same amounts to the lottery account and that two set L subjects in a group also make the same allocation decisions in equilibrium. Under this assumption, all members choose to allocate eight points to the lottery accounts in order to maximize their expected payoffs in the L treatment (Online Appendix A1). They can each raise their expected payoffs by two points in equilibrium in the L treatment. Optimal allocation amounts differ in terms of endowment size in the H treatment: subjects from sets H, M, and L allocate 21, 20, and 10 points, respectively, to the lottery accounts in equilibrium. This means that the winning probability is the highest for set H subjects and the lowest for set L subjects in the H treatment. Nevertheless, as shown in Table 1, the expected payoff of each category of subjects is higher in equilibrium in the H treatment than in the L treatment. Lastly, in the VH treatment, subjects of each type would allocate all of their endowments to the lottery accounts in equilibrium. Expected payoffs then reach 100, 40, and 20 points for set H, M, and L subjects, respectively. The standard theory therefore predicts that subjects prefer to have the contest in all of the choice treatments under the assumption of the risk-neutral preference.

The advantage of the contest over the public good does not change even if we assume that subjects are risk averse. This is because they can allocate amounts as small as possible to the lottery accounts while securing a chance of receiving a prize in case the other four members allocate smaller points to the lottery accounts.

Prediction 1: Standard theoretical predictions
All subjects allocate nothing to the public accounts and thus receive their own endowments as their payoffs when the public good regime is selected. By contrast, they have positive expected gains when the lottery contest regime is selected. They therefore vote for the contest.

However, recent experiments have found that people have other regarding preferences, such as inequality aversion (e.g., Fehr and Schmidt 1999; Bolton and Ockenfels 2000) and reciprocity (e.g., Rabin 1993; Dufwenberg and Kirchsteiger 2004; Falk and Fischbacher 2006). These preference models predict that some subjects contribute positive amounts to their public accounts and thus some of them receive payoffs higher than their own endowment amounts under the public good regime. As a result, those subjects' preferences between the two regimes may differ from Prediction 1. Let us suppose that subjects have inequality-averse preferences. For simplicity, we will assume that subject i has the following utility function:

$$u_i(\pi_i|\pi_{-i}) = \pi_i - \mu_i . \frac{1}{N-1} \sum_{j=1}^{N} (\pi_j - \pi_i)^2 \quad (3)$$

Here, μ_i is the utility weight of subject i on inequality and N is the group size ($N = 5$).[11] Subjects are assumed to be heterogeneous: μ_i differs by subject. As illustrated in Online Appendix A2, the mutual full free-riding equilibrium (i.e., $c_i = 0$ for all i) no longer occurs for a broad range of μ. Moreover, the inequality aversion model predicts that a higher percentage of set H subjects, compared with set L subjects, allocate positive amounts to the public accounts regardless of the allocation amounts of set L or M subjects, as they have much higher endowments. The inequality aversion model also predicts the conditional cooperative behavior of set L and M subjects because they do not like to see inequality with their group members.

Prediction 2: Contributions to the public good based on inequality aversion
(a) Some subjects contribute positive amounts to the public accounts. (b) A higher percentage of set H subjects, relative to set L subjects, contribute positive amounts to the public accounts, regardless of the contribution amounts of set M and set L subjects. (c) The contribution amount of a set L or M subject is positively correlated with his or her beliefs on the contribution amounts of the other members.

Note that regarding Prediction 2b, a set H subject's optimal contribution amount may depend on his or her belief. He or she may decide how much inequality to reduce according to μ. For instance, suppose that a set H subject believes that each of two set M subjects in her group would contribute seven points and each of two set L subjects in her group would contribute one point to the public account. In that case, if the set H subject contributes twenty-eight points, the five subjects obtain almost the same payoffs and hence the Gini coefficient would be minimized (which would be .00312).[12] However, the set H subject would most likely contribute less than twenty-eight points as her material payoff would have some utility weight.

We also note that despite Prediction 2b, set H subjects would not contribute very large amounts. In the previous example, if the set H subject contributes more than twenty-eight points, the payoff distribution is reversed and the payoff of the set H subject becomes the lowest in her group. Even if set M and set L subjects contribute all of their endowments, when the set H subject contributes her full fifty points, the set H subject would receive a much smaller payoff than the other subjects.[13]

In the lottery contest regime, only one individual in the group wins a prize. Predictions based on social preferences in such a risky environment need an additional assumption. There are two ways to model social preferences, as studied by Brock, Lange, and Ozbay (2013). One is to assume that a subject i cares about the ex post distribution of income in her group. Under this assumption, as shown in equation (3), the inequality-averse agent incurs a large utility loss due to a high inequality

in the contest, regardless of whether the agent wins or loses.[14] Therefore, those who are more concerned about ex post inequality would be more likely to vote for the public good. Combined with Prediction 2a, we have the following prediction:

Prediction 3: Voting based on ex post inequality aversion
If subjects care about ex post inequality within their groups and Prediction 2a holds, then they vote for the public good in all treatments.

Another way to model social preferences in the risky environment is based on subjects' likelihood of winning (see Brock, Lange, and Ozbay 2013). If subject i cares about ex ante opportunities to receive high payoffs, we can assume that his or her utility depends on his or her expected payoffs and those of his or her four peers: $\{E[\pi_i]\}_{i\in\{1,2,3,4,5\}}$. The degree of inequality is measured using the Gini coefficient. The Gini coefficient of the equilibrium expected payoffs with the standard theoretical assumption is .327 under the public good regime (five members' payoffs are 50, 20, 20, 10, 10), .300 under the contest regime with a prize of 50 (five members' payoffs are 52, 22, 22, 12, 12), .292 under the contest regime with a prize of 110 (five members' payoffs are 57.5, 27.2, 27.2, 13.6, 13.6), and .327 under the contest regime with a prize of 220 (five members' payoffs are 100, 40, 40, 20, 20). Therefore, in a situation in which all subjects behave selfishly, the public good regime has more unequal ex ante expected payoff distribution than the contest regime in the L and H treatments. This implies that if ex ante equality is more important to subjects than ex post equality, they will not vote for the public good in these two treatments unless Prediction 2a holds. By contrast, in the VH treatment, the ex ante inequality is equal in the public good and contest regimes.

Prediction 4: Voting based on Ex ante inequality aversion
If neither material incentives nor risk attitudes drive subjects' institutional choices, then (a) subjects vote for the contest regime in the L and H treatments unlike Prediction 3 and (b) a higher proportion of subjects in the L and H treatments, compared with the VH treatment, vote for the contest.

It should be noted that in Prediction 4, subjects' allocation behaviors under the public good and contest regimes are assumed to follow the predictions of the standard theory (Table 1). Subjects' voting decisions can be different from this benchmark, for example, if Prediction 2 holds.

There is also a possibility that subjects' risk preferences drive their institutional choices. The distribution of a subject's ex post payoffs substantially differs between the two regimes. The range of a subject's possible payoffs is larger in the lottery contest regime: while a higher payoff is possible, he or she obtains nothing from the contest if he or she loses. In particular, the contest regime in the H or VH treatment generates a higher expected return, but subjects may perceive it as being more risky,

as they believe that larger amounts must be invested to win the competition. Hence, more risk-averse subjects may vote for the public good.

Prediction 5: Risk preferences and voting
While more risk-averse subjects vote for the public good, more risk-loving subjects vote for the lottery contest.

We can test Prediction 5 by using the elicitation task used by Holt and Laury (2002). This task consists of ten questions, each of which asks subjects to choose an option between a risky lottery and a safe lottery. We use the number of risky options chosen by a subject (which we denote as $\eta \in \{0, 1, 2, \ldots, 10\}$) as a proxy of his or her risk preference. If Prediction 5 holds, then the average η of supporters of the public good should be significantly smaller than that of supporters of the contest.

Results

Fourteen sessions, four for each choice treatment and two for the control treatment, were conducted at the University of Michigan in April and May 2014 and in January 2016. The experiment was programmed using z-Tree 3.3.4. (Fischbacher 2007). Almost all of the subjects were undergraduate students there. They were recruited via solicitation e-mails using a recruiting website, ORSEE (Online Recruitment System for Economic Experiments). No subjects participated in more than one session. No communication was allowed during the sessions. Experimental sessions lasted on average from one to one-and-a-half hours, and subjects earned on average US$22.75 (including a participation fee of US$5). Neutral framing was used in all instructions and experiments.[15]

Subjects' Voting Results

Table 2 reports subjects' votes. A strikingly large portion of subjects, around 70 percent in total, voted for the public good under each of the two voting rules, contrary to Prediction 1 (see the "total" row in Table 2). A closer look at individual votes by endowment reveals that high percentages of support for the public good from set *M* and set *L* subjects do not depend on the size of prize under the lottery contest regime; their votes for the public good are more than 70 percent in all of the three choice treatments. The percentage of set *H* subjects who support the public good is lower than that of set *M* and set *L* subjects, but it is at a high level, a little above 50 percent, in the L and H treatments; it is also 33 percent in the VH treatment where set *H* subjects have a large advantage under the alternative contest regime (Table 1). These observations contradict Prediction 4. This may mean that (i) subjects' material incentives or risk preferences drive them to vote for the public good, (ii) the Gini coefficients of subjects' ex ante expected payoffs are different from those predicted by the standard theory, and/or (iii) ex post inequality aversion affects subjects' voting decisions. As explained later, our detailed analyses show that while

Table 2. Voting Decisions and Outcomes: Individual Conditional Voting Decisions.

			Number of votes		Percentage	
Treatment	Subject category	Regime	Under EV[a]	Under WV[a]	Under EV	Under WV
L	Set *H*	Public good	8	8	53	53
		Contest	7	7	47	47
	Set *M*	Public good	23	21	77	70
		Contest	7	9	23	30
	Set *L*	Public good	21	23	70	77
		Contest	9	7	30	23
	Subtotal	Public good	52	52	69	69
		Contest	23	23	31	31
H	Set *H*	Public good	8	6	62	46
		Contest	5	7	38	54
	Set *M*	Public good	21	20	81	77
		Contest	5	6	19	23
	Set *L*	Public good	21	20	81	77
		Contest	5	6	19	23
	Subtotal	Public good	50	46	77	71
		Contest	15	19	23	29
VH	Set *H*	Public good	5	5	33	33
		Contest	10	10	67	67
	Set *M*	Public good	22	23	73	77
		Contest	8	7	27	23
	Set *L*	Public good	23	25	77	83
		Contest	7	5	23	17
	Subtotal	Public good	50	53	67	71
		Contest	25	22	33	29
Total		Public good	152	151	71	70
		Contest	63	64	29	30

Note: L = Low; H = High; VH = very high; EV = Equal voting rule; WV = Weighted voting rule.
[a]The numbers in the EV and WV columns indicate the numbers of individual votes under the equal and weighted voting rule, respectively.

subjects' votes may be influenced by material benefits under the public good when the size of the prize in the contest is low, possibilities (ii) and (iii) play important roles, especially in the H and VH treatments.

Regarding the effects of endowment size on subjects' votes, it was found in this study that the smaller the endowments assigned to subjects, the more likely the subjects were to vote for the public good (Online Appendix Table B2). It was also found that subjects' voting decisions were affected only slightly by voting rules.[16]

Table 3 reports collective vote outcomes. It shows a significant difference between the equal voting and weighted voting rules due to the large difference in individual

Table 3. Voting Decisions and Outcomes: Realized Collective Vote Outcomes.

Treatment	Regime	EV[a] (%)	WV[a] (%)
L	Public good	80	60
	Contest	20	40
H	Public good	100	78
	Contest	0	22
VH	Public good	89	33
	Contest	11	67
Total	Public good	89	60
	Contest	11	40

Note: L = Low; H = High; VH = Very High; EV = Equal voting rule; WV = Weighted voting rule.
[a]The numbers indicate the realized collective vote outcomes under each voting rule as percentages of cases. Online Appendix Table B1 includes the counts of groups. Table B1 also includes the hypothetical results for cases where each voting rule was used to all groups based on individual votes in Table 2.

preferences according to endowment size. It was found that the public good was significantly more likely to be selected with the equal voting rule than with the weighted voting rule.[17] Especially in the VH treatment, around 67 percent of set *H* subjects voted for the contest whereas more than 70 percent of set *M* and set *L* subjects voted for the public good. Set *M* and set *L* subjects outweighed set *H* subjects' opposing votes under the equal voting rule, but not always under the weighted voting rule.

Result 1: (a) Prediction 1 does not hold: around 70 percent of subjects voted for the public good. (b) The smaller the endowments assigned to subjects, the more likely the subjects were to vote for the public good. (c) The public good is more likely to be selected under the equal voting rule than under the weighted voting rule.

Subjects' Action Choices

Subjects on average contributed positive amounts under the collectively selected public good regime (Figure 2), which is consistent with Prediction 2a. Part of the subjects' action choices can be explained by inequality-averse motives. Strong conditional cooperative behavior was observed under the public good regime with set *M* and set *L* subjects, as in Prediction 2c. That is, their contribution amounts were positively correlated with their beliefs on the (average) allocation amounts of set *M* and set *L* subjects in their groups (Online Appendix Table B5). This resonates with the idea that subjects are inequality-averse and prefer a smaller inequality in payoffs.

Result 2: The contribution amounts of set *M* and set *L* subjects in the public good regime were positively correlated with their beliefs on the contribution amounts of the other subjects from set *M* and set *L*.

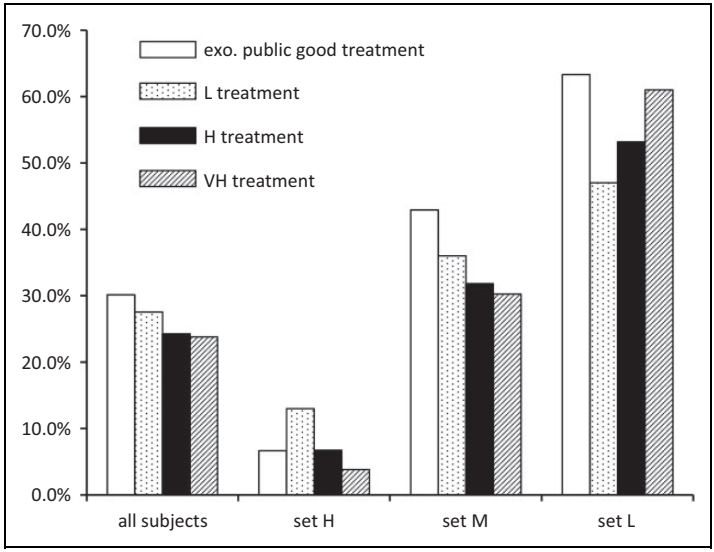

Figure 2. Average contribution in the public good regime. Each bar was calculated by: 100·(the average contribution in the category)/(their endowments). Each of the "all subjects" bars was calculated by: 100·(the average contribution of all subjects in the corresponding treatment)/22. Here, 22 is the average endowment amount (= 110/5).

However, some subjects' behavior under the public good regime cannot be explained by the inequality aversion model. It was found that a significantly *smaller* proportion of set *H* subjects, compared with set *M* or *L* subjects, contributed positive amounts to the public good (Online Appendix Table B3).[18] This contradicts Prediction 2b. Also, this cannot be explained by the differences in beliefs between set *H* subjects and set *M* or *L* subjects on the contribution amounts of other group members—the differences were not statistically significant for most comparisons in all of the choice treatments (Online Appendix Table B4).[19] Moreover, set *H* subjects contributed significantly smaller percentages of endowments than subjects in the other categories (Figure 2 and panel 2 of Online Appendix Table B3). Set *M* and set *L* subjects correctly anticipated this behavior of set *H* subjects (Online Appendix Table B4). Although these results cannot be explained by inequality aversion, they are consistent with the well-known experimental evidence that subjects' contribution amounts are dependent on their MPCRs (e.g., Fisher et al. 1995; Zelmer 2003). An MPCR is the highest for set *H* subjects and the lowest for set *L* subjects, as shown in equation (1).[20] In addition, it is consistent with the findings of past studies showing that subjects' endowment size and level of cooperation are negatively correlated in public goods games when endowments are heterogeneous.

Result 3: A significantly smaller proportion of set *H* subjects, compared with that of set *M* and set *L* subjects, contributed positive amounts to the public accounts.

Despite their correct beliefs that set *H* subjects would contribute a lower percentage of endowment than they did, set *M* and set *L* subjects still believed that they would obtain significantly higher payoffs than those predicted by standard theory under the public good regime (Online Appendix Table B8). A subject's ex ante expected payoff was calculated using his or her own allocation amount and his or her beliefs regarding the other four members' allocation amounts.[21]

In the lottery contest regime, the average allocations to the lottery accounts by subjects of each category were smaller than the standard theoretical predictions under risk neutrality (Online Appendix Table B6 and Table 1). This implies that they were on average risk averse.

An exploration of subjects' beliefs reveals that both set *M* and set *L* subjects in the L treatment believed that set *H* subjects had allocated significantly more than eight points (the allocation amount predicted by standard theory with risk neutrality) to the lottery accounts and that their own winning probability would be less than the standard theoretical predictions (Online Appendix Table B7). Moreover, in all choice treatments, both set *M* and set *L* subjects believed that set *H* subjects had allocated the largest amounts in their groups. Pessimism due to the expectation about set *H* subjects' high allocations may prevent subjects with medium-sized and low endowments from voting for the contest.

Result 4: Subjects in all categories allocated smaller amounts to the lottery accounts than the standard theoretical predictions. Set *M* and set *L* subjects believed that set *H* subjects had allocated larger amounts to the lottery accounts than themselves and therefore assumed higher probabilities for set *H* subjects to win than for themselves in each choice treatment.

Ex ante and Ex post Material Incentives

An interregime comparison of subjects' ex ante expected payoffs reveals that relative material payoffs between the two regimes depend on endowment size and prize size in the lottery contest (Figure 3 and Online Appendix Table B9). In the L treatment, set *M* and set *L* subjects on average believed that they would receive significantly higher expected payoffs under the public good regime, but set *H* subjects believed that the payoffs would be almost identical between the two regimes. In the H treatment, although set *L* subjects again believed that they would obtain higher expected payoffs with the public good, both set *H* and set *M* subjects believed that their payoffs would be higher under the contest regime. Thus, set *H* and set *M* subjects faced conflicts with set *L* subjects in terms of ex ante material interests in the H treatment. In the VH treatment, subjects in all three categories believed that they would obtain higher expected payoffs, although the difference was insignificant for set *L* subjects, under the contest regime. Therefore, there are no conflicts in the VH treatment if subjects are only concerned about their own material payoffs.

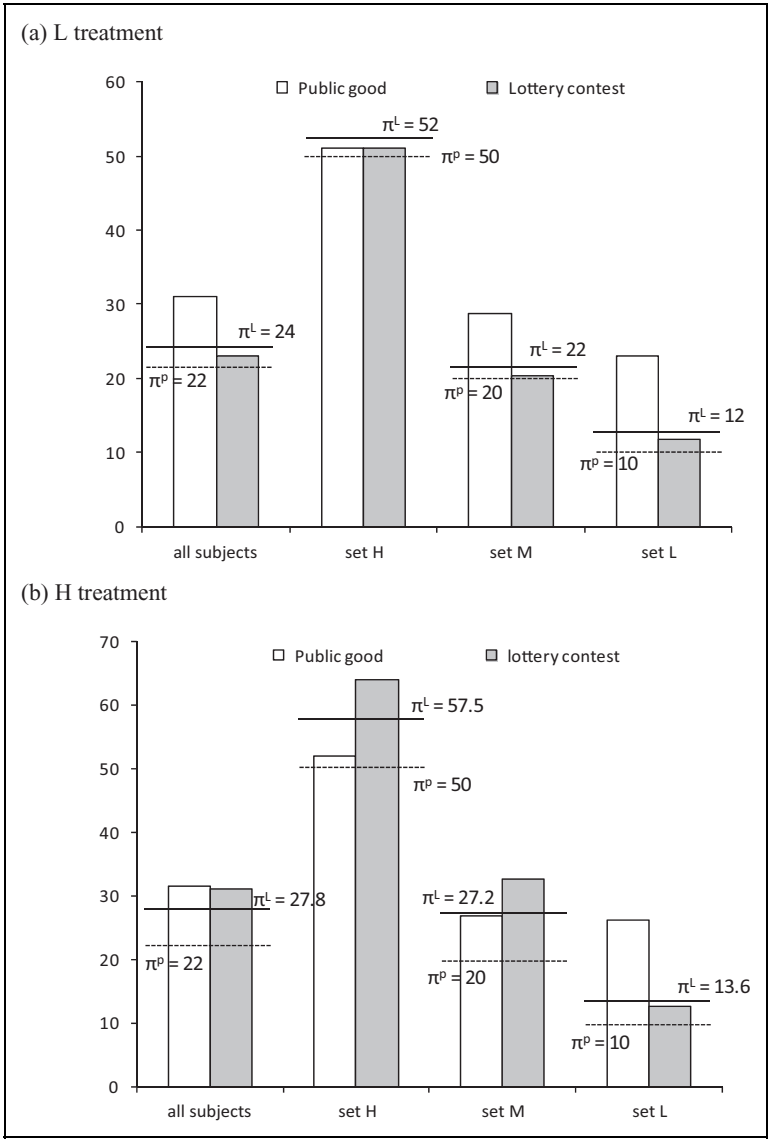

Figure 3. Average ex ante expected payoffs based on beliefs: (a) L treatment, (b) H treatment, and (c) VH treatment. π^p (π^L) indicates expected payoffs under the public good (the lottery contest) based on the standard theoretical predictions with the risk-neutral preference. A subject's believed ex ante expected payoff was calculated based on his or her own allocation decision and beliefs on allocation amounts of the other four members. Figures of average realized payoffs are found in Online Appendix Figure B1.

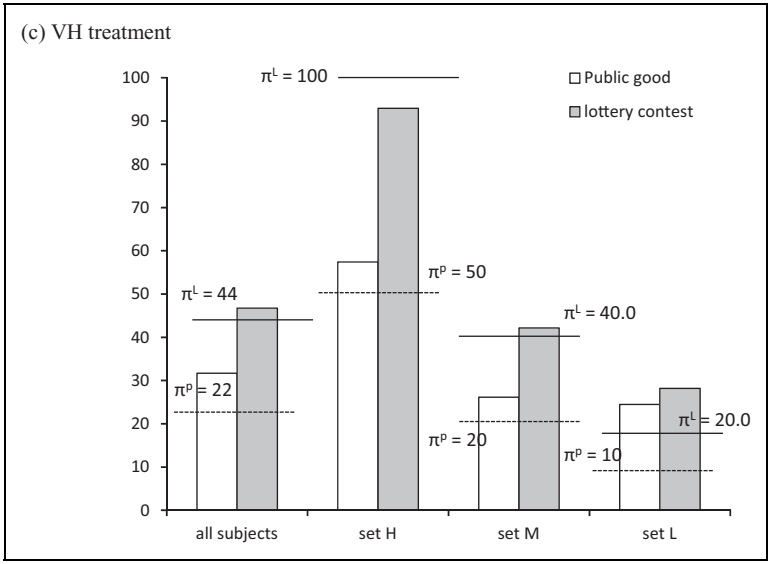

Figure 3. (continued)

Result 5: Set *L* subjects believed that they would obtain significantly higher payoffs with the public good in the L and H treatments, but not in the VH treatment. Set *H* and set *M* subjects believed that they would obtain significantly higher expected payoffs with the contest in the H and VH treatments.

Online Appendix Figure B1 and Table B10 report average ex post payoffs by treatment. These show that the total payoffs (average payoffs) were in fact higher in the contest regime than in the public good regime in the H and VH treatments, although the majority of groups did not select the contest in these two treatments.[22] The higher efficiency under the contest regime may imply that subjects face a trade-off between efficiency and inequality in the H and VH treatments. The degree of inequality under each of the two regimes is explored in the next subsection.

Result 6: The total ex post payoffs (efficiency) were higher in the contest regime than in the public good regime in the H and VH treatments; they were lower in the contest regime than in the public good regime in the L treatment.

Gini Coefficients in the Two Regimes

As mentioned, set *M* and set *L* subjects' strong support for the public good was surprisingly similar across the three choice treatments, despite the changes in the material incentives across the treatments. Recall that set *M* subjects especially had much higher material expected payoffs with the contest than with the public good in

the H and VH treatments.[23] Second, despite set *H* subjects believing that they would have very high material payoffs in the contest, a significant fraction of set *H* subjects voted for the public good in the H and VH treatments. These results suggest that subjects' voting decisions, especially set *M* subjects' and some set *H* subjects', were driven not only by the level of their *own* ex ante expected payoffs. What can explain the seemingly irrational voting behavior of the subjects? Detailed analyses suggest that their votes are affected by inequality-averse concerns.

First, regardless of endowment size, subjects believed that the Gini coefficients of expected payoffs would be much smaller with the public good than the contest (Figure 4a and Online Appendix Table B11). The differences in the Gini coefficients between the two regimes were especially large for set *M* and set *L* subjects. Each subject's believed Gini coefficient in his or her group was calculated using equation (1) or (2). For this calculation, the ex ante expected payoffs of the five group members were computed based on the subject's own allocation amount and his or her belief regarding the allocation amounts of the other four members. The smaller believed Gini coefficients with the public good suggest that the votes of some set *H* and set *L* subjects as well as set *M* subjects may be affected by the difference in the ex ante inequality between the two regimes.

In order to formally test the impact of ex ante inequality-averse concerns on subjects' voting, two regression analyses were conducted separately for (1) groups that selected the public good (PG groups, hereafter) and (2) groups that selected the lottery contest (conflict groups, hereafter). The dependent variable is a dummy which equals 1 if a subject votes for the public good; it equals 0 otherwise, for both the PG and conflict groups. Independent variables include subjects' ex ante Gini coefficients with the public good and with the contest for the PG and conflict groups, respectively.[24] Notice that PG groups include not only subjects who voted for the public good but also those who voted for the contest. The same holds true for conflict groups. If ex ante inequality aversion plays an important role in subjects' voting decisions, the size of subjects' perceived Gini coefficients with the public good would be *negatively* correlated with their support for the public good in PG groups; subjects' perceived Gini coefficients in the contest would be *positively* correlated with their support for the public good in conflict groups. This turned out to be true (Table 4).[25] These regression results suggest that people with more ex ante inequality-averse concerns are more likely to vote for the public good.

Result 7: Regardless of endowment size, subjects' ex ante expected payoffs based on beliefs are more equally distributed with the public good than the contest. In the groups where the public good was selected, those who voted for the public good expected a smaller degree of inequality than those who voted against it.

Second, a similar observation can be made with ex post inequality between the two regimes. Figure 4b reports the average Gini coefficients of subjects' realized

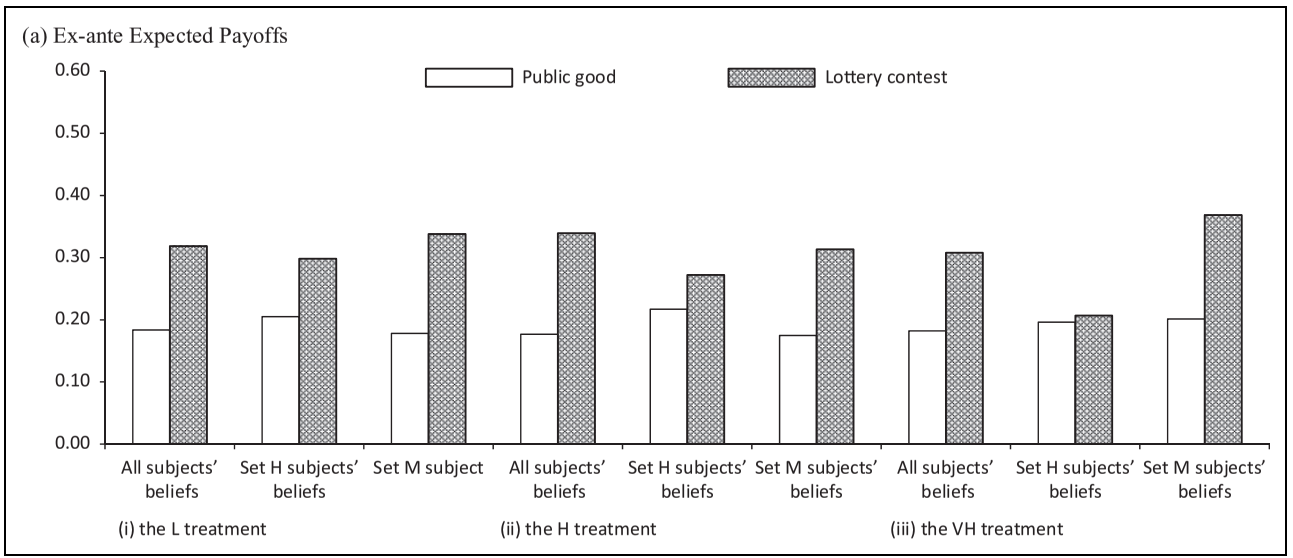

Figure 4. Average Gini coefficients of subjects' payoffs by regime: (a) ex ante expected payoffs. Each bar indicates the average believed Gini coefficient across all subjects or across set *H* subjects or set *M* subjects. We first calculated each subject's (*i*) own ex ante expected payoff and (*i*) believed other four members' ex ante expected payoffs based on his or her allocation amount and beliefs, using equation (1) or (2). We then calculated each subject's Gini coefficient. The data for set *L* subjects are found in Online Appendix Table B11.

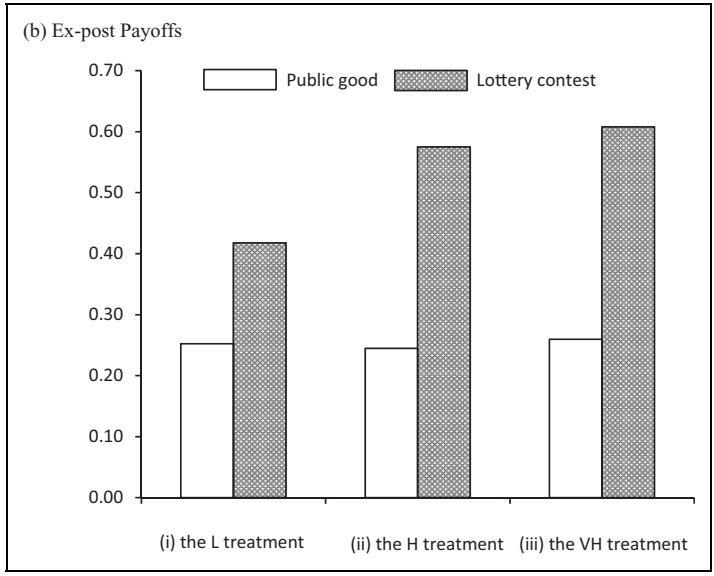

Figure 4. (continued) (b) Ex post payoffs. Each bar in figure (b) indicates the average realized Gini coefficient in groups by regime.

payoffs within a group. The Gini coefficients in the lottery contest regime were on average 65 percent, 135 percent, and 134 percent higher than those in the public good regime in the L, H, and VH treatments, respectively.[26] The significant differences in the degree of ex post inequality between the two regimes suggest that subjects' ex post inequality-averse motives may also drive their support for the public good. Figure 4b further indicates that the average ex post Gini coefficients under the contest are much higher in the H and VH treatments than in the L treatment. Recall that the Gini coefficients of ex ante expected payoffs in the contest regime are similar across the three choice treatments (Figure 4a), but material incentives with the contest are higher in the H and VH treatments than in the L treatment. These observations imply that subjects' ex post inequality-averse concerns can discourage them from voting for the contest, at least in the H and VH treatments. These findings resonate with the results of Brock, Lange, and Ozbay (2013) that the ex ante expected payoff comparison alone cannot explain people's decisions in a risky environment. This interpretation, along with the voting data by set M subjects and some set H subjects, is also consistent with the finding of Bartling et al. that people have strong aheadness aversion.

Result 8: The Gini coefficients of ex post payoffs are much smaller for the public good than for the contest.

Table 4. Subjects' Voting and Believed Gini Coefficients under Collectively Selected Regimes.

	PG groups		Conflict groups	
	(1)	(2)	(3)	(4)
Subject's believed Gini coefficient based on her beliefs with public good in columns (1) and (2); with lottery contest in columns (3) and (4)	−0.94** (0.40)	−0.82** (0.41)	2.07** (0.80)	1.33 (0.89)
Endowment {= 10, 20, 50}	—	−0.0043** (0.0021)	—	−0.011** (0.0044)
Risk attitudes (η) {= 0, 1, 2, . . . , 10}	—	−0.026 (0.017)	—	−0.0083 (0.043)
Price size {= 50, 110, 220}	—	—	—	0.00028 (0.0008)
Constant	0.98*** (0.079)	1.16*** (0.12)	−.19 (0.26)	0.29 (0.47)
No. of observations	155	155	60	60
F	5.45	3.81	6.66	3.49
Prob > *F*	.0209	.0114	.0124	.0131
Adjusted R^2	.0281	.0520	.0875	.1443

Note: Dependent variable: a dummy which equals 1 if subject *i* voted for the public good regime and 0 otherwise. Linear regressions. The numbers in parenthesis are standard errors.
*, **, and ***indicate significance at the .10, .05, and .01 levels, respectively.

Risk Preferences and Subjects' Votes

Another factor that could be responsible for subjects' institutional choices is risk attitudes. However, our data does not support Prediction 5. The average risk attitudes (η) were not significantly different between supporters of the public good and those of the contest for most of the subjects from sets *H*, *M,* and *L*, regardless of the prize size in the contest (Online Appendix Table B12; also see Table 4). This suggests that risk attitudes are not the most important factor in subjects' voting decisions.

> **Result 9:** Prediction 5 does not hold. Risk attitudes were not significantly different between those who voted for the public good and those who voted for the contest.

The Democratic Process and Subjects' Votes

Lastly, we note that there is a possibility that subjects' voting decisions may be affected by the endogenous process, such as the effects of signals sent through voting

and the democracy premium—impact that the democracy directly has on people's beliefs and/or preferences (e.g., Tyran and Feld 2006; Dal Bó, Foster, and Putterman 2010; Kamei Forthcoming). We could expect that the presence of the endogenous process may make subjects vote for the public good, assuming that some subjects have non-standard preferences. These endogenous effects alone do not explain subjects' collective institutional choices, however. The average contribution amounts to the public good were, in fact, slightly lower in the three choice treatments than in the Exogenous public good treatment (Figure 2). This suggests that the democratic process is not the most important factor that drives subjects' institutional choices in this environment. This result, along with Results 1 and 5 to 9, suggests that it is more reasonable for us to interpret the voting decisions made by some subjects—especially set *M* subjects and some set *H* subjects—as their dislike for an unequal distribution of payoffs among members.

Conclusions

This article provides the first experimental evidence concerning people's collective choices between a policy that helps the less endowed to a greater degree—a public good regime—and a policy that promotes competition—a lottery contest regime—in a situation where the resources of individuals are unequally distributed. In the experiment, around 70 percent of the subjects voted for the public good. Subjects with medium-sized and high endowments believed that their expected payoffs would be higher if they selected the contest in which the size of the prize was large. Nevertheless, a substantial number of subjects in the two categories supported the public good. As a result, the public good was selected in most groups, even when the prize size in the contest was high and accordingly the efficiency was in fact higher with the contest than that with the public good.

A closer look at our data reveals that the voting behavior of some of the subjects—especially those with medium-sized or high endowments—can be explained by inequality-averse concerns. The distributions of payoffs within groups—not only for ex post payoffs but also for ex ante expected payoffs based on subjects' beliefs—were more equal with the public good than with the contest. It was also found that subjects' believed Gini coefficients in the public good regime were negative predictors regarding their support for the public good.

Our article has two implications regarding people's collective institutional choices. First, the results suggest that people's inequality-averse motives may be strong enough to drive their collective institutional choices away from competitive rules. This implies that a competition scheme may not be collectively implemented in a society or an organization even though it may generate a materially better outcome than an alternative with a public good aspect. Second, recent papers, including Ertan, Page, and Putterman (2009), Putterman, Tyran, and Kamei (2011), and Kamei, Putterman, and Tyran (2015), have shown that institutions which may materially benefit all members equally in social dilemmas while not sacrificing equality are more likely to be collectively

selected when an equal voting rule is used because the majority of assenting votes outperform the minority of dissenting votes by antisocial individuals who favor the right to free ride. Our results suggest that competitive policies, even those that offer material benefits to people, may be *less likely* to be selected with an equal voting rule (compared with a weighted voting rule), when there is an alternative offering a public good aspect if the population's inequality-averse preferences are sufficiently strong and the competitive policies generate a greater inequality among people.

The second implication extends to the context of conflict resolution and postconflict peace building. In a postconflict country, if the leaders attempt to rebuild the country without addressing inequality among people, it may generate grievances resulting from people's strong preferences for equality as evidenced in the present study, which could lead to another conflict. Moreover, it is known that policies with public good aspects can mitigate conflicts in different situations. For instance, social welfare policies that reduce inequalities may contribute significantly to conflict resolution, including terrorism (e.g., Burgoon 2006).[27] Our findings imply that strengthening democratic norms in the decision-making process could help resolve international and domestic conflicts, as policies with public good aspects are more likely to be collectively selected with a more democratic voting rule.[28]

We acknowledge that our result appears to contradict light or moderate redistributive policies currently observed in some societies or organizations. The reason for this discrepancy could be because the moderate redistributive policies seen in reality are the consequences of some political processes. Our experiment indeed shows that when the prize in a contest is high, the contest regime will be more easily selected when the rich group has more voting power. We could therefore conjecture that as the majority of people prefer cooperative policies over competitive policies when resources are heterogeneously distributed, policies may be pulled in a more redistributive direction in the long term if there is a trend of employing more democratic decision-making systems. Further experimental or empirical investigations, examining not only people's collective preferences but also the effects of political processes in relation to policy choices, are desirable.

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Supplemental Material

The online appendices are available at http://jcr.sagepub.com/supplemental.

Notes

1. Atkinson, Piketty, and Saez (2012) report that the Gini coefficient increased by 8.4 percentage points in the United States from 1976 to 2006.
2. The subjects made choices between a tournament and a piece rate scheme in these two papers.
3. This setup was adopted to obtain data without reputation effects.
4. They were not informed about the presence of this task at the onset of the experiment to avoid making this task salient. They were instead told that additional questions unrelated to the main experiment may be asked.
5. As an anonymous referee pointed out, however, I acknowledge that some real-world examples do not perfectly fit the public good regime due to the methods of collecting resources to operate the redistribution mechanism. For example, tax and/or transfer mechanisms are usually used to implement redistribution policies in societies, but the adoption of taxation and/or subsidization creates a deadweight loss. For the sake of simplicity, our experimental design did not explicitly incorporate a possibility of such a deadweight loss. Similar simplifications without explicitly incorporating a deadweight loss in experiments have been adopted in some past studies (e.g., Tyran and Sausgruber 2006).
6. For the sake of simplicity, we adopted a single-prize lottery contest design rather than a multiprize contest setup.
7. For example, each set *M* subject was asked about his beliefs on (a) the allocation amount of his set *H* subject, (b) the allocation amount of the other set *M* subject, and (c) the average allocation amount of the two set *L* subjects in his group.
8. Weighted voting (WV) rules are often used in organizations, such as International Monetary Fund (e.g., Rapkin and Strand 2006) and shareholder meetings of corporations.
9. For example, each set *M* subject was asked about his belief on the voting decisions of the set *H* subject, the other set *M* subject, and the two set *L* subjects for each of the two voting rules.
10. This kind of strategy method is commonly used when there is a need to obtain a sufficient number of incentive-compatible decisions under each of many possible conditions (e.g., Fehr, Herz, and Wilkening 2013; Dal Bó, Foster, and Putterman 2010; Kamei Forthcoming).
11. The use of a quadratic form, instead of the functional form proposed by Fehr and Schmidt (1999), is due to its tractability.
12. In this example, the set *H*, *M*, and *L* subjects obtain payoffs of 30.8, 30.6, and 31.0 points, respectively.

13. The set H, M, and L subjects obtain payoffs of 22.0, 44.0, and 55.0 points, respectively, in this case.
14. $E[u_i(\pi_i|\pi_{-i})|G_i] = E[\pi_i|G_i] - \mu_i \cdot \frac{1}{N-1}\sum_{j=1}^{N} E[(\pi_j - \pi_i)^2|G_i]$, where G_i is the probability distribution of each member's winning in the group of subject i based on (a) subject is own allocation decision and (b) subject is belief about the allocation amounts made by the other four members. $\sum_{j=1}^{N} E[(\pi_j - \pi_i)^2|G_i]$ is much larger with the contest than with the public good.
15. Loaded words such as "contribute" and "public good" were avoided.
16. The number of votes for the public good under the equal voting rule (152 of 215 votes) is not significantly different from that under the weighted voting rule (151 of 215 votes) according to a two-sample z-test of proportion (p value = .916, two-sided).
17. The public good was significantly more likely to be implemented under the equal voting than under the weighted voting rule according to a two-sample z-test of proportion (p value = .0372, two-sided). We also calculated the hypothetical likelihood of two regimes being implemented if the assigned voting rule was different (i.e., if the vote was conducted with the weighted voting rule in groups where the equal voting rule was assigned, and if the equal voting rule was used in groups where the weighted voting rule was assigned). See Online Appendix Table B1.
18. The levels of contributions were similar across the three categories of subjects in the L treatment because of one set H subject who contributed his or her full endowment.
19. It also implies that the less frequent positive contributions of set H subjects cannot be explained by reciprocity models.
20. As discussed in the prediction section, the difference in marginal per capita return means that set H subjects received lower payoffs than subjects in the other categories if they contributed very large amounts. This can also partially explain the set H subjects' small contributions if they are inequality-averse agents.
21. Equation (1) or (2) was used. For instance, a set M subject's believed payoff in the public good regime was calculated by: $20 - C_M + .2 \cdot 2 \cdot (C_H^b + C_M + C_M^b + 2C_L^b)$. Here, C_M is the contribution of the set M subject, and C_i^b is the set M subject's belief concerning the contribution amount of the set $i \in \{H, M, L\}$ member.
22. The regime under which a subject would receive a higher payoff depends on whether he or she wins the competition in the contest. In the L and H treatments, set H subjects on average received higher payoffs with the contest than with the public good, whereas set M and set L subjects received higher payoffs with the public good than with the contest. In the VH treatment, conversely, set H subjects on average received higher payoffs with the public good, whereas set M and set L subjects received higher payoffs with the contest.
23. We acknowledge that set L subjects' strong support for the public good in the L and H treatments can be explained by income maximization as their material payoffs (both ex ante and ex post) were higher with the public good. However, as for the VH treatment, set L subjects' material payoffs with the contest were indeed higher than with the public good. Despite the higher material incentives in the contest, set L subjects' strong support

for the public good was almost the same in the VH treatment as that in the L and H treatments.

24. The idea to explore the correlation between subjects' votes and perceived Gini coefficients was provided by an anonymous referee.
25. Significantly positive correlations between subjects' votes and perceived Gini coefficients are robust even with the inclusion of control variables for PG groups—see columns (1) and (2). This is not the case for conflict groups. This is possibly due to the small sample size in the contest (the majority of groups selected the public good as discussed previously).
26. Mann–Whitney tests show that the differences in the average Gini coefficient between the two regimes are significant in all treatments (panel (b) of Online Appendix Table B11).
27. I acknowledge the ongoing debate about whether inequality and poverty can trigger terrorism. Some authors argue that a link between the two may not exist or may be weak (e.g., Krueger and Maleckova 2004).
28. Li (2005) shows that democratic participation, defined as voter turnout, is a negative predictor for a number of transnational terrorist incidents. He also shows the proportional representation system, compared with the majoritarian or mixed representative system, helps reduce such incidents. Part of the reason why democracy may reduce terrorist incidents may be that policies aimed at mitigating conflicts are more likely to be implemented with more democratic norms present as in our article.

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